

**REMARKS**

Claims 1-63 remain in this application. Claims 1-3 are rejected. Claims 4-63 are objected to. Claims 1-63 are amended herein to clarify the invention, to broaden language as deemed appropriate and to address matters of form unrelated to substantive patentability issues.

Applicants herein traverse and respectfully request reconsideration of the rejection of the claims and objections cited in the above-referenced Office Action.

The Office Action states that the specification is objected to for various informalities. Applicant submits herewith a substitute specification and abstract wherein amendments are effected to place the text thereof into proper English in accordance with 37 CFR 1.125(c) and to address the noted informalities. Also accompanying this amendment is a reproduction of the original specification and abstract with markings indicating the amendments effected in the substitute specification in accordance with MPEP §608.01(q) and 37 CFR 1.125(b). No new matter is added. Entry of the substitute specification and abstract is respectfully requested.

Claim 1 and 3 are objected to for noted informalities. The claims are amended to address these informalities. Therefore, withdrawal of the objections is earnestly solicited.

Claims 4-63 are objected to under 37 CFR §1.75(c) as being in improper multiple dependent depending from other multiple dependent claims. The claims have consequently not been treated on the merits. Claims 4-63 are amended to remove the improper multiple dependencies. Withdrawal of the objection and substantive examination of the claims are respectfully requested.

Claims 1-3 are rejected as obvious over Morgan et al. (US 5,040,362) in view of Jauss (US 3,894,382) under 35 U.S.C. §103(a). The applicants herein respectfully traverse this rejection. For a rejection under 35 U.S.C. §103(a) to be sustained, the differences between the features of the combined references and the present invention must be obvious to one skilled in the art.

It is respectfully submitted that a *prima facie* case of obviousness could not be established in rejection of amended claims 1-3. "To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on the applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20

USPQ2d 1438 (Fed. Cir. 1991)." MPEP §706.02(j) "Contents of a 35 U.S.C. §103 Rejection".

As presently written, independent claim 1 recites a harvesting apparatus which comprises in pertinent part:

at least one circulating endless conveyor which leads cut stalks to a delivery area at an end of a working strand thereof for delivering harvested plants to an inlet opening of a further processing apparatus, the endless conveyor comprising conveyor links articulated to one another, . . . a forward portion of each of the conveyor links which faces outwardly in a direction of the cutting means and the cut stalk holding means, and which collectively comprises a front side of the endless conveyor, being structurally configured such that the front side of the endless conveyor is substantially closed to an opposed side thereto.

As claimed, the endless conveyor, which is collectively constituted by articulated conveyor links, includes a forward portion, i.e., a side facing the cutting and cut stalk holding means, which is substantially closed to an opposed side, i.e., a side of the conveyor links facing inwardly of the endless conveyor loop. As stated

in the specification, such configuration inhibits, to a great degree, penetration of plant remnants or soil into the links of the endless conveyor, thereby improving continued reliability of the harvesting apparatus. Applicants respectfully submit neither of the proffered references teach or suggest this feature.

In particular, the conveyor links disclosed and shown in the Morgan et al. reference, for example, in Fig. 5, are entirely open, and do not include a configuration that would serve to close a front side of the endless conveyor constituted thereby from an opposed side. As seen in Fig. 5, the articulated mountings of the connected links and any internal mechanisms are fully exposed to a front of the conveyor, and passage of material therethrough is not inhibited by the disclosed structure. The reference designator 105 in Morgan et al. denotes a vertical plate provided behind the conveyor links, and appears to be for purposes of providing back support to a working strand of the endless conveyor, and not for shielding the conveyor mechanisms located inward of a front face of the endless conveyor, such as, for example, an internal drive and the like, from debris.

Likewise, the disclosure of Jauss is silent regarding the above feature claimed in claim 1. The reference is merely cited for teaching directed to cutting means which are provided as part of an endless conveyor.

Thus, the combination of prior art references fails to teach or suggest all the claim limitations as properly required for establishing a *prima facie* case of

obviousness. Therefore, reconsideration of the rejections of claims 1-3 and their allowance are respectfully requested.

Applicants further submit that claims 4-63, which depend from claim 1, are also believed patentable, as deriving patentability from therefrom, as well as for the additional recitations they contain. Favorable action on the merits is earnestly solicited.

In light of the foregoing, the application is now believed to be in proper form for allowance of all claims and notice to that effect is earnestly solicited. Please charge any deficiency or credit any overpayment to Deposit Account No. 10-1250.

Respectfully submitted,

JORDAN AND HAMBURG LLP

By 

Frank J. Jordan  
Reg. No. 20,456  
Attorney for Applicants

Jordan and Hamburg LLP  
122 East 42nd Street  
New York, New York 10168  
(212) 986-2340

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Spec.  
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HARVESTING EQUIPMENT FOR STALKED PLANTS

BACKGROUND OF THE INVENTION

The invention relates to harvesting equipment for harvesting corn or similar stalked plants according to the introductory portion of claim 1. Such harvesting equipment, designed especially as a front-end apparatus for a mobile processing apparatus, such as a chopper, serves for gathering, cutting off and transferring corn plants, for example, to the further processing apparatus.

In ~~our own order~~ DE 33 24 899 C2, a machine is disclosed for harvesting stalked plants, in which the plants are gathered by a front-end cutting machine, cut off and fed to a chopper. The gathering and cutting apparatus has a chain system circulating across the line of travel. The chain system consists of two conventional endless long-link roller chains whose holding fingers are associated with anvils and with stationary knives cooperating with counter-knives for cutting off and carrying the stalked corn plants. The chains have tongues above and below them, between which are open spaces defined by vertical pins. The stationary knives mounted underneath the chain system, and the knife holders corresponding thereto form a planar slide surface to guide the chain system. In

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order to achieve reliable guidance of the cornstalks after they are cut off, holding fingers and anvils are provided so that the cornstalks can be fed to the chopper by simultaneous contact with the holding fingers and the anvil in a position slightly inclined from the perpendicular. Not until the cornstalks are near the point where the chain movement reverses are they released by the fact that, due to the turning of the upper and lower long-link roller chain about sprockets positioned on different axes, the release of the holding action produced by holding fingers and anvils is brought about. A principal shortcoming of the conveying and cutting system described above is ~~to be seen in the fact~~ that, under the conditions of operation prevailing in its use (contact with earth, water and plant remnants), sufficient resistance to wear, especially of the long-link roller chains, cannot be achieved. The chains jam and lose their carrying ability. Replacement of individual chain links is also quite complicated ~~[[by]]~~ due to the great number of parts.

### SUMMARY OF THE INVENTION

The invention is addressed to the problem of creating a harvester for harvesting corn or other such stalked plants, with which the plants can be cut off over great working widths in a trouble-free manner and fed to an adjoining

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processing apparatus. The harvester ~~is to achieve~~ achieves a satisfactory useful life even under the severe operating conditions of agriculture.

The ~~invention solves the problem~~ above objects of the invention are achieved with ~~[[the]]~~ a harvester ~~with the features of claim 1~~ which includes at  
5 least one circulating endless conveyor for gathered plants, having at an end a  
delivery area for delivering the harvested plants to an inlet opening of a further  
processing apparatus. The endless conveyor comprises conveyor links articulated  
to one another, and at least one lower cutting plane including outwardly pointing  
cutting means and at least one holding plane above it comprising outwardly  
10 pointing holding means for holding the cut stalks. A front side of the endless  
conveyor facing the cutting and holding means is made to be substantially closed.  
~~Regarding the further configuration of the invention, see claims 2 to 63.~~

In the ~~inventive~~ harvester according to the invention, any penetration of plant remnants or soil into the links of the endless conveyor is virtually entirely  
15 prevented. Due to the closed front surfaces, the endless conveyor is constructed  
like an encapsulated unit, in which an internal drive of the endless conveyor or  
conveyors can operate without being adversely affected by plant or soil remnants.



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If two holding levels are provided one above the other, the severed stalks can advantageously be transported in a virtually perpendicular position transversely of their length, in which case the space between the holding levels is also closed off, so that no leaves, which extend outwardly from the lower part of the stalks, can penetrate into the chain. If an upper holding level is offset in the working position from the lower one in the line of travel, the mowed stalks are prevented from tilting forward in front of the working length of the endless conveyor, where they would interfere with the harvesting operation. Instead, the stalks are transported in this manner in a slightly rearwardly inclined position.

If the endless conveyor is constructed as a single working unit, that is, in one piece overall or having parts permanently joined together, the result is a simple structural form of the conveyor links. They can be replaced without problems. In the case of a plurality of assembled parts for the formation of a conveyor element, they can be secured against rotation by interlocking and can be affixed to one another with only a single central bolt, which facilitates assembly in the manufacturing process and in maintenance and replacement. Multiplicity of parts, as was the case with open link chains, is thereby avoided.

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Also, [[the]] deflection shields for the formation of the closed front face are advantageously integrated into the conveyor links and form a fixed component of each conveyor link.

~~To special advantage~~ In accordance with a particularly advantageous  
5 embodiment, the deflection shields are configured so that, in the entrance to a  
chopper or the like, they form a continuous curved track free of indentations. If  
the delivery area is formed, for example, by a large sprocket wheel on the back of  
the endless conveyor, the curved track can curve following the radius of this  
sprocket wheel. For this purpose, the individual deflection shields each have a  
10 shape that bulges forward, so that together they form an arch in the delivery area.  
If, in the delivery area, a parallel position of the conveyor links is created, for  
example, by two end sprockets, a flat shape of the deflection shields can be  
achieved as an alternative.

Due to the continuous, uninterrupted curve of the track, it is possible to  
15 provide strippers for the endless conveyors in the delivery area, which then can be  
immobile and be each at a constant distance from the deflection shields of the  
conveyor links.

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Particularly advantageously, these [[These]] strippers are ~~very~~  
~~advantageously~~ disposed on both sides of the inlet opening of the further  
processing apparatus and form lateral guiding surfaces for the plants. The feeding  
of plants to the chopper is virtually loss-free.

5            If flat bodies are formed in the holding planes and have projections in the  
plane of the flat body as drivers, the drivers can be made in one piece with the flat  
bodies, which offers especially great stability and can be achieved at considerably  
less trouble than, for example, welding the drivers to portions of the conveyor  
links.

10           The links can be made entirely as one-piece castings.

            Of special importance for the trouble-free gathering and guiding of the  
stalked plants by the conveying and guiding elements of the endless conveyor is  
the shape of the gaps between the projections, which serve as recesses to contain  
the severed stalks, as are also the spatial arrangement of the flat bodies of the  
15           middle and upper conveying and guidance planes. In an advantageous  
embodiment, the edges of a projection, defining the gaps and leading in the  
direction of rotation of the endless conveyor and of a projection situated in the

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upper conveying and guiding plane, and trailing in the direction of rotation of the endless conveyor, are parallel to one another. For example, a cornstalk engaged by these edges assumes a position tilted against the direction of rotation of the endless conveyor. Furthermore, it is provided that the edges defining the gap to  
5 receive the stalked plants are disposed at an acute angle to a plane at the particular flat body, passing through the end pivot axes of each conveying and guiding element and, with that, parallel to the direction of rotation of the endless conveyor. Thus, a holding effect is produced for the stalked plants, which are in the gaps between the projections. By means of this holding effect, a reliable and  
10 thus trouble-free transfer of the severed stalked plants to a downstream processing apparatus, in the nature of a chopper unit, can be achieved. An advantageous shape of a projection situated in the middle conveying and guiding plane is obtained if this projection, as seen from one of the conveying and guiding planes, assumes the shape of a rectangle (parallelogram) shifted against the direction of  
15 rotation of the endless conveyor, possibly with rounded corners, while in the upper conveying and guiding plane, a projection with a triangular shape is preferred.

Within the scope of the invention, however, still other embodiments of the gaps between the projections of the flat bodies in the middle and upper conveying

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and guiding planes are conceivable for receiving the stalked plants. For example, it is possible to provide the flat bodies with two projections each, in which the edges defining the gaps are aligned either approximately parallel to one another and/or the distances between the edges defining the gaps become greater as seen  
5 in the conveying and working direction.

According to another advantageous aspect of the invention, circular segments are assigned at the leading side in the direction rotation of the endless conveyor and circular recesses at the trailing side to the drivers and their holding bodies in the lower conveying and guiding plane and the flat bodies in the middle  
10 and upper conveying and guiding plane. These segments and recesses mesh with one another with slight clearance when the conveyor links are in the connected state. The result is, on the one hand, simple and effective shields for the protection of bearing elements between each pair of conveyor links and, on the other hand, this method of construction prevents the formation of protruding  
15 edges on concatenated conveying and guiding elements which can lead to trouble in the harvesting process.

Another advantageous aspect lies in the nature of the connection between the concatenated conveying and guiding links of an endless conveyor. A

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swiveling connection can be created between two adjacent conveying and guiding elements, in which sliding friction, which tends to produce much wear in dirty connections, does not occur. To achieve this, the conveying and guiding link has a bearing housing, in which bearing elements in the form of sealed rolling

5 bearings are contained, on the side, which is trailing in the direction of rotation of the endless conveyor. To simplify work in the assembly of an endless conveyor so constructed, the conveyor links will be designed so that they can be assembled from a lower and an upper section and fastened. This makes it possible, in assembling the sections, for a pin associated with the upper section and held

10 therein to engage in a bearing of the lower section of a conveyor link leading with reference to the direction of rotation of the endless conveyor and containing a bearing element. Both sections can then be joined together by a screwed joint. The bearing elements can, in that case, be sealed rolling bearings, wherein sealed grooved ball bearings are preferably [[being]] used. The bearing cases

15 simultaneously form teeth for engagement by a driving wheel having recesses matching the teeth.

It is evident from the above comments that an endless inventive conveyor comprises a conveyor system formed from a plurality of swiveling concatenated conveyor links, which is guided and driven at least through a drive sprocket and

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an idle sprocket. In a further development of the invention, it is also conceivable to insert a driving wheel and several reversing wheels into the deflection areas of the endless conveyor and especially in the transfer and unloading area of the endless conveyor at an inlet to a processing machine. It is furthermore entirely  
5 conceivable to associate with the driving wheel of the endless conveyor, in an area close to the unloading area of the endless conveyor, additional conveyors or also stationary guiding means for improving the delivery of the stalked material to the processing apparatus, which can also be supplied with driving energy by the driving wheel.

10 Movable cutting knives, such as rotating cutting knives, which act either in the free cut or in interaction with the cams of the cutting plane and are disposed below the endless conveyor, are particularly advantageous.

Furthermore, it is advantageous to provide a counter-blade in the region of the entrance. The cams of the cutting plane and other cams close above, pass over  
15 and under the cutting blade, so that plant residues, especially leaf residues, which stick to the cams, are comminuted by the stationary counter-blade and cannot wind around the cams.

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Further advantages and details arise out of the examples of the object of the invention, which are described in the following, read in conjunction with the accompanying drawings, and shown in the drawing, in which

BRIEF DESCRIPTION OF THE DRAWINGS

- 5      Figure 1      is [[shows]] a perspective view of an inventive harvester with two gathering and transporting apparatuses, which are constructed in a mirror-image relationship to one another[[,]];:
- Figure 2      is [[shows]] an enlarged, partially truncated view of detail X in Figure 1[[,]];:
- 10      Figure 3      is [[shows]] a view similar to that of Figure 2, but without leaf and plant lifters[[,]];:
- Figure 4      is [[shows]] a truncated, perspective view of an inventive endless conveyor, with a diagrammatically shown plant stalk as seen in a direction opposite to the traveling direction[[,]];:



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Figure 5 is [[shows]] a perspective view of a transporting and guiding element in a representation exploded in sections~~[[,]]~~;

Figure 6 is [[shows]] a view from above of the transporting and guiding element shown in Figure 5, during the transport of a plant  
5 stem~~[[,]]~~;

Figure 7 is [[shows]] a truncated perspective representation of the inventive harvester, as seen in the direction of arrow B in Figure 1~~[[,]]~~;

Figure 8 is [[shows]] an enlarged, partially truncated perspective view of the drive of an endless conveyor as detail Y in Figure 1~~[[,]]~~;

10 Figure 9 is [[shows]] a detail of a plant lifter with a guiding ring disposed resiliently thereon~~[[,]]~~;

Figure 10 is [[shows]] a representation similar to that of Figure 1, with a self-propelled vehicle carrying the harvester and the further processing system~~[[,]]~~;

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Figure 11 is ~~[[shows]]~~ an alternative embodiment of a conveyor link with a guiding shape in the lower plane~~[[,]]~~;

Figure 12 is ~~[[shows]]~~ a partially cut away view from above of the alternative conveyor with conveyor links of Figure 11~~[[,]]~~;

5      Figure 13 is a perspective view of a ~~shows a perspectively shown~~ portion of the working strand of the alternative conveyor, partially cut away~~[[,]]~~;

Figure 14 is a perspective view of ~~[[shows]]~~ the deflection region at the edge of the entrance of the alternative conveyor~~[[,]]~~;

10      Figure 15 is ~~[[shows]]~~ a section along line XV-XV in Figure 12~~[[,]]~~;

Figure 16 is ~~[[shows]]~~ a representation similar to that of Figure 5 of an alternative conveyor link~~[[,]]~~;

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Figure 17 is [[shows]] an exploded representation of the lower part of the conveyor link of Figure 26, approximately corresponding to a section XVII-XVII in Figure 16; and

Figure 18 is [[shows]] a view similar to that of Figure 7 of an alternative embodiment of a fixed counter-knife in the transfer area.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The harvester 1 can be used especially as front-end equipment 2 for a mobile working unit S of the chopper type for row crop or non-row crop harvesting of stalked plants 3, such as corn or the like. As a rule, corn fields are arranged as well as harvested in rows, which offers the advantages that automatic steering equipment can be used on the harvesters 1, and also a more uniform run is achieved than when it is driven transversely across the hilling created around the plants and the ditches between the rows. In the case of such harvesting in disregard of the rows, it happens that the front-end unit sinks partly into the ground or rises above it, so that a uniform cutting height is not always assured. ~~Even so~~ This notwithstanding, the inventive harvester 1 is also very well suited for use independently of rows.

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The harvester 1 of Figure 1 consists of at least one and preferably, as shown here, of two gathering and transporting units 4 and 5 aligned in their full length across the working and running direction F and constructed in mirror-image relationship to one another, which are arranged side by side so that a wide  
5 swath can be harvested. Between the gathering and transporting units 4 and 5 is a central dividing point 6 for dividing the swath between the gathering and transporting units 4 and 5. To make the harvester 1 follow a working direction [[S]] E, a supporting frame 7 is provided, which comprises supporting arms 8 and 9, which are articulated more or less about the transport and working direction F.  
10 By means of these supporting arms 8 and 9, the gathering and transporting systems 4 and 5 can be changed from the working and harvesting position represented in Figure 2 to a transport position, wherein they assume an approximately vertically aligned (upfolded) position for a narrower width over the road with minimum interference with the forward view of ~~the driver~~ the driver.  
15 For this purpose, the alignment of the pivot axes of the supporting arms 8 and 9 on supporting frame 7 is made, so that the pivot axes, looking in the transport and working direction F, run slightly apart and/or have a downwardly inclined alignment, so that, in the transporting position, the driver looks at the rear sides of the transport devices 4 and 5, at which the reverse strands extend and otherwise  
20 has a free field of view. Pursuant to the invention, each gathering and transport

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system 4 and 5 consists of a circulating endless conveyor 10 and 11, which can be carried and driven in an outer end area by drive sprockets 12 and 13 with axes of rotation 12.1 and 13.1 near an area for unloading and transfer by the endless conveyors 10 and 11 to the processing apparatus, such as a chopper, and by sprockets 12 and 13, which are similar in form to the drive sprockets 12 and 13. The direction of the rotation of the endless conveyors 10 and 11 is indicated by U1 and U2, runs approximately athwart the line of travel F and is directed toward the middle of the harvester 1. Additional conceivable embodiments of a harvester can also be configured so that the directions of rotation U1 and U2 of the endless conveyors 10 and 11 are at an angle rearward against the working and travel direction F and toward the center of the harvester.

As it can furthermore be seen in Figure 1, each gathering and transport device 4, 5 has, on the one hand, leaf and plant lifters 15 to facilitate the gathering of lying or partially lying stalked plants and, on the other, to support the endless conveyor 10, 11 in feeding the stalked plants to the processing apparatus, and they consist substantially of parting points of pyramidal shape and a guiding hook 17. The guiding hooks 17 are of such a shape that they extend first approximately parallel to a working strand 18 of the endless conveyor 10, 11, and reach to the distance that is necessary to allow the stalked plants 3 to pass to the next leaf and

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plant lifter 15 in the direction of rotation U1, U2. The guiding hook 17 is spring mounted, being put under tension by the force of a spring 200 in the direction of the arrow 201, as shown in Figure 9. This pretension acts substantially counter to the line of travel F and is directed against the working strand 18 of the endless conveyor 10 or 11. Thus, a channel 202 is formed between the guiding hook 17 and the working strand 18 for the transport of the severed plants 3[[:]] the plants 3 [[are]] being held securely in this channel 202. The channel extends in the embodiment of Figure 1 across the line of travel F. Since the guiding hooks 17 are displaceable against the spring force, even very thick stalks 3 or clusters thereof are carried simultaneously through the channel 202 (Figure 8) in the directions U1 and U2. The force of the springs 200 is adjustable.

Furthermore, at least one stalk and plant divider 19, 20 is provided as a dividing means between the cut and uncut plant stalks in each gathering and transport device 4, 5. The severing of the stalked plants can be supported by, for example, driven rolling elements 23, 24 equipped with a spiral 21, 22 associated with the stalk and plant dividers 19 and 20.

In Figures 2 and 3, portions of the gathering and transport device 4, 5 are represented in an enlarged perspective view but, in Figure 3, no leaf and plant

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lifters 15 are provided. As it appears especially from these Figures, an inventive endless conveyor 10, 11 consists of a plurality of conveyor links 25, 26 and thus constitutes a flexible conveyor system 27, which can be carried along different paths. In the embodiment represented, the conveyor links 25, 26 of the flexible  
5 conveyor system 27 are guided in the working strand 18 along a rectilinear path of movement established by a guiding plate 28, a retaining edge 29 of each conveyor link 25, 26 engaging in a slot 30 in the guiding plate 28. As shown in Figures 16 and 17, a sliding or rolling bearing on a post 129 can be provided, which can be guided in a groove 130 in the guiding plate 128. In this case, the friction is  
10 reduced by the bearing. For example, instead of the friction guidance, a rolling friction of the conveyor links 25, 26 is made possible to hold them and guide them on the back in direction U1 or U2, which reduces the friction.

It can furthermore be seen in Figure 17 that the cutting means 31, which is to be easily replaceable when worn, is held by only a single central screw 134; a.  
15 A further securing is provided by a downwardly bent tab 135, which engages an opening 136 in the flat portion 44 bearing the cutting means 31.

The rectilinear working strand 18 leads into an arcuate return end (Figure 1) near the transfer area 14 of the endless conveyor 10, 11 and into a likewise

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rectilinear idle strand 18.1 and the other arcuate outside return end. In an alternative embodiment of the invention, however, either the working strand 18 can have a path of movement, which curves toward or away from the line of travel F, or, especially in the vicinity of the inside reversal end, it can pass around a plurality of driving and/or idle sprockets. The endless conveyor 10, 11 then runs in the end sprocket area at least over a short length counter to the line of travel.

The basic construction of a first version of a conveying and guiding element 25, 26 as well as an endless conveyor 10, 11, ~~composed~~ comprised thereof pursuant to the invention, is to be seen in Figures 4 to 6. As ~~[[it]]~~ can be seen, especially in Figure 4, the conveying and guiding elements 25, 26 of the endless conveyor 10, 11 are divided into three conveying and guiding planes A, B and C spaced vertically one over the other. Carriers 31 are provided in these conveying and guiding planes, which either serve as counter-knives 32, 33 and thus form a mowing and cutting system 35 in cooperation with a stationary knife 34 (Figure 7) situated underneath the conveying and guiding elements 25, 26, or serve as a holder 36 for guiding the stalked plants 3 as they are transferred to a processing apparatus in the nature of a cutting unit of a chopper. In the conveying and guiding plane A, the carriers 31, which are configured as counter-knives 32, 33, are disposed, while the carriers 31, which are provided as holders 36, are



mounted in the conveying and guiding planes B, C. In the scope of the invention, however, a division of the conveying and guiding elements 25, 26 into two or more than three conveying and guiding planes can be contemplated.

In Figure 5, an advantageous embodiment of a conveying and guiding link  
 5 25, 26 is shown. For reasons of easy installation in the assembly of an endless conveyor, provision is made for dividing the conveying and guiding elements 25, 26 into a lower section 37 and an upper section 38. The sections 37, 38 of the conveying and guiding link 25, 26 are preferably configured so that the junction, at which sections 37, 38 can be fastened together, is in the conveying and guiding  
 10 plane B. The result is that the lower section 37 consists substantially of a holding body 39 to accommodate the carrier 31 configured as a counter-knife 32, 33, an upper connecting plate 40 and a guiding body 41 for a stripper 42 (Figure 7) welded like a bridge between the holding body 39 and the upper connecting plate 40. On the side of the conveying and guiding link 25, 26 following with respect  
 15 to the direction of the rotation U1, U2 of the endless conveyor 10, 11, a bearing housing 43 is provided, which is likewise fastened by welding to the other parts of the lower section 37. The bearing housing 43 simultaneously forms a means of attachment for the driving of the endless conveyor 10, 11 by a drive sprocket 12, 14. The sprocket 12, 13 (Figure 8) again has the recesses 13.2 corresponding to

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the means of attachment or bearing housings 43. The endless conveyor 10, 11 thus in its entirety forms a compact, enclosed unit. To mount the carrier 31 serving as counter-knife, pins (not shown) are provided, for example, on the underside of the holding body 39 and engage in a pattern of holes in a flat portion of the counter-knives 32, 33, so that the counter-knives 32, 33 can then be locked in place by driving flat-head screws from the bottom into the counter-knives 32, 33. The counter-knives 32, 33 themselves are hook-shaped and, on the portion projecting from the bottom section of the conveying and guiding elements 25, 26, a beveled cutting edge is created. The upper section 38 consists substantially of a flat body 45 lying in the conveying and guiding plane B holding the stalks and a flat body 46 in the holding plane C, an additional, upright deflection shield 47 being affixed by welding to the flat bodies 45, 46 to form a continuous front face and to cooperate with the stripper 48 (Figure 7). In the flat body 45 of the conveying and guiding plane B, a downwardly pointing bolt 49 is inserted on the side leading in the direction U1, U2 of the rotation of the endless conveyor 10, 11 and is affixed to the flat body 45. Above the flat body 46 of the conveying and guiding plane C serving as a holding plane for the stalks 3, there is a cover plate 50, which can be bolted to the flat body 46 to cover the free space between the flat bodies 46 of two adjacent conveying and guiding elements 25, 26, which is necessary for the passage of the endless conveyor 10, 11 through an end sprocket

area. The cover plate 50 (Figure 16) can be cranked so that conveying and guiding links 25,26 adjacent one another in the sprocket area can pass one over the other and, in general, assure good protection also of the upper side of conveyor 10, 11 against dirt.

5           The form and the spatial arrangement of projections 51, 52 on the flat bodies 45 in the conveying and guiding plane C and of the projections 53, 54 on the flat bodies 46 in the conveying and guiding plane C are of special importance to the trouble-free gathering and carrying of the stalked plants 3 in the conveying and guiding elements 25, 26 of the endless conveyor 10, 11. In the embodiment  
10       represented in Figures 5 and 6, there is a space 55 between the projections 51, 52 and 53, 54 for receiving the stalked plants 3 (see Figures 4 and 6), this space 55 being defined by the confronting edges 56, 57, 58 and 59 of the projections 51, 52 and 53, 54. As it can be seen in Figures 4 and 6, the need for a reliable holding of the stalked plant 3 in the gap 55 is affected mainly by the shape and the  
15       arrangement of the edges 57, 58 of the conveying and guiding link 25, 26.

Therefore the edges 57, 58 defining the space 55 and aligned approximately parallel to one another have an alignment in which, as represented in Figure 6, they enclose an angle W with a plane 62 passing through terminal axes of rotation 60, 61 of the conveying and guiding link 25, 26, which is preferably in an angular

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range, which is equal to or less than  $90^\circ$ . Thus, the edge 57 of projection 52 is an obstacle to any accidental dropping of the stalked plant 3 out of the gap 55 in a conveying and guiding link 25, 26. For the projections 51, 52 of the flat body 45 in the conveying and guiding plane B, their desirable pattern is a rectangle  
5 (parallelogram) slanting against the direction of rotation U1, U2, in the conveying and guiding plane A, B, C, while in the case of the projections 53, 54 of the flat body 46 in the conveying and guiding plane C, an approximately triangular shape is preferred.

In a further embodiment of the invention, there is the possibility of  
10 providing only one projection 52 in the conveying and guiding plane B in the flat body 45 and of providing only one projection 53 in the flat body 46 in the conveying and guiding plane C, so that [[then]] a gap 55 thereby defined by the edges 57 and 58 is formed for receiving the stalked plant 3, the edges 57, 58 being aligned at least approximately parallel to one another. To improve the holding  
15 action on the stalked plant 3 in a gap 55 in the conveying and guiding elements 25, 26, in the embodiment, the flat body 46 of the conveying and guiding plane B is set back into an inner area 63 of the endless conveyor 10, 11. Thus, the stalked plants 3 can also assume a position inclined slightly rearwardly against the travel and working direction F, so that the position of the center of gravity changes and

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therefore the cornstalk is clutched more tightly in the gap 55. Likewise, more free space is obtained, which makes it possible for still another cornstalk to be taken into the gap 55. As it can be seen in Figures 5 and 6, the plate bodies 45, 46 of the conveying and guiding planes B and C and the holding body and the flat portion

5 44 of the counter-knives 32, 33 have arcuate sections 64, 65, 66 and 68 at the leading ends of the endless conveyor 10, 11, with respect to its directions of rotation U1, U2, while at the trailing end, with respect to its directions of rotation U1, U2, recesses are created. In the assembled state, these arcuate sections 64, 65, 66, 67 and the arcuate recesses mate with one another with slight free play and

10 bring about, on the one hand, that bearing elements 72 contained in the bearing housing 43 are protected by an effective shielding against dirt and, on the other hand, prevent trouble from occurring during the harvesting operation by plant residues catching on projecting edges of the conveying and guiding elements 25, 26. Since, in the area of the conveying and guiding plane B, there is a separation

15 point, there are also, of course, the necessary connecting plates 40 needed in order to produce a connection between the lower section 37 and the upper section 38, with corresponding arcuate segments and arcuate recesses.

The swiveling connection 73 (Figure 5) is created by the fact that a lower section 37, in the bearing housing 43 of which bearing elements 72, configured as

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sealed, maintenance-free roller or grooved ball bearings, are inserted, can be introduced into a pocket-like free space in the lower section 37 of a trailing conveying and guiding link 25, 26, so that then, when the sections 37 and 38 are assembled, the bearing bolt 49 of the upper section 38 passes through bores 74, 75 and thus, simultaneously, the bearing elements 72 of the lower section of the leading conveying and guiding link 25, 26. A bolt not shown can serve to lock the sections 37, 38, being mounted in a bore 76 of the connecting plate 40 and a bore, also not shown, in the plate body 45.

The above description of the transport elements 25, 26, as well as the placement of the reference numbers refers to an embodiment, which is represented in Figure 5 and can be used, with reference to the travel and working direction F, on the right side of the harvesting machine 1. For a harvesting machine for use on the left side of a machine, parts of mirror-image shape are used, bearing the same reference numbers.

As seen especially in Figure 7, guiding bodies 41, 47 are placed between the conveying and guiding planes A-B and B-C of each conveying and guiding element 25, 26 and cooperate with a stripper 42, 48. Pursuant to the invention, the guiding bodies 41, 47 have such a shape 77, 76, directed at the strippers 42, 48,

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that a virtually movement-free (recoil- and shock-free) stripping of the stalked plants 3 from the endless conveyor 10, 11 can be achieved in the area 14 of the transfer from the endless conveyor 10, 11 to a processing apparatus S in the nature of a cutting unit of a chopper. To this end, the shape 77, 78 facing the strippers  
5 bulges outward, for example, and the curvature of the contour 77, 78, as seen from one of the conveying and guiding planes A, B and C, follows the curvature of the path of the movement of the endless conveyor 10, 11 in the transfer area 14, so that consequently the curvature of the contour 77, 78 is made circular. As [[it]] furthermore ~~appears~~ depicted in Figure 7, the strippers 42, 48 are combined in a  
10 single component and are made adjustable by means of a screw 79 in relation to a frame assembly 80 of the gathering and transport apparatus 4, 5.

The strippers 42, 48 in the delivery area 14 of the endless conveyors 10, 11, are arranged on both sides of and in symmetry with a vertical longitudinal central plane of the vehicle and thus form lateral guides for the cornstalk 3, by  
15 which the latter is steered into the inlet opening of the chopper. The strippers 42 and 48 sweep substantially completely over space between the bottom cutting plane A, the first holding plane B above it, and the uppermost second holding plane C. In their rear portion, the strippers 42, 48 are combined in a flat body standing on edge, so that there is no gap between them. Only in the front area, in

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which the strippers 42, 48 attack the front face 77, 78 of the endless conveyors 10, 11, is there a horizontal division of the strippers 42, 48, in order thereby to permit the plate 45 forming the lower holding plane B to pass with its projections 51 and 52 between the strippers 42 and 48.

5           The upstanding front edges of the strippers 42, 48, in the line of travel F, are disposed very close to the deflection shields 41, 47, so that the latter are completely cleared by the strippers. ~~On account~~ By virtue of the curving front faces and the clear circular path provided by the deflection shields 41, 47 in the transfer area 14, in which the latter are driven by a sprocket, the distance of the front edges of the strippers 42, 48 from the deflection shields 41, 47 can be kept constant. The space between the front edges and the deflection shields 41, 47 remains equal. Even when the conveyor links are carried in a straight line counter to the line of travel, it would be possible to maintain the distance between the then-planar face of the deflection shields 41, 47 and the strippers 42, 48. To achieve better stripping, the strippers 42, 48 can be spring-loaded. The strippers 42, 48 can be locked in the working position. To permit maintenance, this lock must be released. The strippers 42, 48 can, for example, then be swung out of the working position and be completely cleaned.

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Instead of locking the strippers, it is also possible to mount the strippers resiliently so that the strippers can be opened against the force of the spring for cleaning. The strippers 42, 48 ~~consist~~ are comprised, for example, of spring steel.

In chopping operations in the field, the harvester 1 is driven as a front-end unit in a working direction [[S]] E in the manner of a chopping machine configured especially as a self-powered chopping machine in the embodiment considered, with a gathering and conveying apparatus disposed on the left and right of the center of the chopping machine in an operating position (see Figure 1) close to the ground and/or supported at least partially on the ground on skids or the like. As seen in the traveling and working direction F, the individual endless conveyors 10, 11 are set at a slight slant, so that their upper, table-like covers point downward at the front and upward at the rear. The two stalk and plant ~~separators~~ dividers 19 and 20 mounted on the outer end define the maximum working width of the harvester 1. The endless conveyor 10, 11 of each gathering and conveying apparatus 4, 5 moves in the direction of rotation U1, U2. Stalked plants 3 are caught by the drivers 31 in the form of hook-shaped counter-knives 32, 33 and cut off by the cooperation of the counter-knives 32, 33 with the knife 34 situated underneath the endless conveyor 10, 11 and then grasped in the gap 55 between the projections 51, 52 and 53, 54 of the conveying and guiding elements

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25, 26. The stalks 3 are then in a slightly inclined position as represented in  
Figures 4 and 6, leaning counter to the direction of rotation U1, U2 and counter to  
the traveling and working direction F, and are carried in this position transversely  
of the line of travel F to a transfer and discharge area 14 of the gathering and  
5 conveying system 4, 5. By means of strippers 42, 48 located therein, the stalked  
plants 3 are released from the gaps 55 in the conveying and guiding elements 25,  
26 and can thus be collected and chopped up by a processing machine in the  
nature of a cutting unit of the chopper.

In an alternative embodiment (Figure 11 to Figure 15), moving knives are  
10 disposed under the plane of rotation of the conveyors 10, 11 and are in the form of  
rotating disks 112, 113 in the embodiment. The disks 112, 113 are mounted for  
rotation on the frame 80, with respect to which the endless conveyors are moving.  
Instead of rotating disks, linear knives can be considered, which move back and  
forth lengthwise against one another. The rotating disks 112, 113 can be arrayed  
15 up to into the transfer area 14, in which the plants are carried to the inlet opening.  
Thus, equally good cutting conditions are created for stalks in the area of the  
vertical longitudinal central plane of the vehicle.

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The rotating disks 112, 113 lie parallel to the plane of rotation of the conveyor system 4, 5 and are disposed directly underneath it on the frame 80. The rotating disks 112, 113 are at the same time mounted so as to overlap one another, the disks 112 in an upper plane and the disks 113 in a lower plane. The effective cutting areas thus form only a small sector of the rotating disks 112, 113, so that, in a plan view, the actual cutting edges present only a wavy line. Thus, an approximation to a rectilinear cutting apparatus is achieved. The disks 112, 113 are driven through intermeshing gears 127, which are mounted under the disks 112, 113 and are associated with the frames 80. In the marginal area, the gears 127 can likewise be driven at a transmission ratio through sprockets, which also drive the endless conveyor. It is also possible to uncouple the drives from the endless conveyors 10, 11 and from the rotating disks 112, 113. In any case, uncoupling can be achieved on the basis of the arrangement in separate planes, so that the knives 112, 113 can be replaced on the endless conveyors 10, 11.

The knives 112, 113 can be driven at a high rotary speed and cut the freestanding stalks. Also possible is cooperation with additional cutting means, which can be situated, in a lower plane of the conveyor system 4,5, close to the knives 112, 113.

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In an improved embodiment (Figure 16, Figure 17), an additional driver 131 is provided, which is arranged closely above the driver 31 of cutting plane A, and its leading edge is substantially flush over the front edge of driver 31.

Between the said drivers 31 and 131, there is a fixed counter-knife 132 (Figure 5 18) in the transfer area 14, over and under which the drivers 31 and 132 closely pass. Thus, adhering plant parts, especially fibers of, for example, wilted leaves, are chopped up. Thus, such fibers are prevented from wrapping around the drivers 31, 131 thereby limiting the cutting and guiding ability of such drivers.

The driver 131 can have inwardly pointing projections 133, by which it is held in 10 recesses in the deflection shield 41 and is welded to the back of it, so that the front side is exactly flat and planar and can be made upstanding at right angles in the transition to the deflection shield 41, which permits very close intervals from the fixed counter-knife 132 and stripper 42.

**Abstract of the Disclosure**

**ABSTRACT OF THE DISCLOSURE**

Harvesting equipment (1) A harvesting apparatus for harvesting corn or other such stalked vegetation; ~~the harvesting equipment comprising~~ includes at least one circulating endless conveyor (10; 11) for gathered plants, which ~~at an end~~ forms an area [(14)] at an end thereof for delivery of the plants to an inlet opening of a further processing apparatus; ~~especially a chopper, the~~ The endless conveyor ~~comprising~~ includes conveyor links (25; 26) articulated to one another and at least one cutting plane [(A)] comprising outwardly pointing cutting means cutters and having above it at least one holding plane (B; C) for holding the cut stalks and ~~comprising~~ including lower, outwardly-pointing ~~holding means, is~~ so holders. The endless conveyor is constructed such that a front side (77; 78) of the endless conveyor (10; 11) thereof, facing the ~~cutting and holding means~~ cutters and holders, is of a substantially closed configuration (Figure 3).